I CLAIM:

1. A signal amplitude controlling method for use in a system having an overall gain expressible as the product of a coarse analog gain and a fine digital gain, the method comprising the steps of:

monitoring an input video signal for determining a desired overall gain value;

determining an unfiltered fine gain control value using a first-order filter coefficient of unity and a first coarse gain control value;

monitoring the unfiltered fine gain control value for underflow and overflow outside of a desired range;

in the event no underflow or overflow occurs, using the first coarse gain control value as a second coarse gain control value, and a filter coefficient of less than one to determine a second fine gain control value;

in the event underflow or overflow occurs, using the unfiltered fine gain control value and the first coarse gain control value to determine a second coarse gain control value;

using the second coarse gain control value, determining a second fine gain control value;

applying the second coarse gain control value and the second fine gain control value to the input video signal to produce an output video signal within a pre-selected output amplitude range.

2. A signal amplitude controlling method according to claim 1 wherein the second overall gain value comprises the product of the second coarse gain value and the second fine gain control value.

3. A signal amplitude controlling method according to claim 1 wherein the calculation interval is greater than the line rate of the input signal.

4. A signal amplitude controlling method according to claim 1 wherein the calculation interval is equal to the frame rate of the input signal.

5. A signal amplitude controlling method according to claim 1 wherein the calculation interval is greater than the frame rate of the input signal.

6. A signal amplitude controlling method according to claim 1 wherein the step of determining an unfiltered fine gain control value G_F further comprises steps of:

using a first-order filter coefficient value β of unity, determining an unfiltered fine gain control value G_F according to the relationship;

$G_F = G_F[n-1] + \beta * (a/b + G_F[n-1]) * [N_{NOM} / (N_{BP} - N_{ST}) - 1]$, (Equation 4);

wherein N_{BP} is the mean back-porch level and N_{ST} is the mean sync-tip level for the current video frame;

wherein N_{NOM} is the desired sync height;

wherein *a* is the y-intercept and *b* is the slope of the linear fine gain control equation;

for the condition $G_F < G_{MIN}$, selecting a new coarse gain control value $G_C[n]$, such that a new fine gain control value $G_F[n]$ is maintained between G_{MIN} and G_{MAX};

for the condition $G_F > G_{MAX}$ selecting a new coarse gain control value N_{CG}, such that a new fine gain control value $G_F[n]$ is maintained between G_{MIN} and G_{MAX};

wherein G_{MIN} is a pre-selected minimum fine gain control value, and G_{MAX} is a pre-selected maximum fine gain control value.

7. A signal amplitude controlling method according to claim 1 wherein the step of determining a second coarse gain control value $G_C[n]$ further comprises steps of:

using an unfiltered fine gain control value G_F, and using a first coarse gain control value $G_C[n-1]$, determining a second coarse gain control value $G_C[n]$ according to the relationship,

$$G_C[n] = (a'/b' + G_C[n-1])^* (a/b + G_F) * 0.5^* [(a/b + G_{MIN})^{-1} + (a/b + G_{MAX} + 1)^{-1}] - a'/b' + 0.5 \quad \text{(Equation 5);}$$

wherein G_{MIN} is a pre-selected minimum fine gain control value, and G_{MAX} is a pre-selected maximum fine gain control value, and

wherein a' is the y-intercept and b' is the slope of the linear coarse gain control equation, and a is the y-intercept and b is the slope of the linear fine gain control equation.

8. The method according to claim 1 further comprising the steps of representing the first fine gain control value $G_F[n]$ and the second fine gain control value $G_F[n]$ as a 12-bit digital value and representing the first coarse gain control value $G_C[n-1]$ and the second coarse gain control value $G_C[n]$ as 4-bit digital values.

9. A signal amplitude controlling method according to claim 1 further comprising the step of:

using a first coarse gain control value $G_C[n-1]$, and using a second coarse gain control value $G_C[n]$, modeling a fine gain control value $G_F[n]$ using the relationship,

$$G_F[n] = -a/b + (a/b + G_F) * [(a'/b' + G_C[n-1]) / (a'/b' + G_C[n])] \quad \text{(Equation 7);}$$

wherein a' is the y-intercept and b' is the slope of the linear coarse gain control equation, and a is the y-intercept and b is the slope of the linear fine gain control equation.

10. A method for automatic gain control in a video signal processing system wherein an overall gain may be expressed as the product of a coarse analog gain and a fine digital gain, the method comprising the steps of:

monitoring an input video signal for determining a desired overall gain value;

determining an unfiltered fine gain control value G_F using a first-order filter coefficient of unity and a first coarse gain control value $G_C[n-1]$;

monitoring the unfiltered fine gain control value G_F for underflow and overflow outside of a desired range;

in the event no underflow or overflow occurs, using the first coarse gain control value $G_C[n-1]$ as a second coarse gain control value $G_C[n]$, and a filter coefficient of less than one to determine a second fine gain control value $G_F[n]$;

in the event underflow or overflow occurs, using the unfiltered fine gain control value G_F and the first coarse gain control value $G_C[n-1]$ to determine a second coarse gain control value $G_C[n]$, then using the second coarse gain control value $G_C[n]$, determining a second fine gain control value $G_F[n]$;

applying the second coarse gain control value $G_C[n]$ and the second fine gain control value $G_F[n]$ to the input video signal to produce an output video signal within a pre-selected output amplitude range.

11. The method according to claim 10 further comprising the step of reiterating all steps at intervals greater than once per video signal line.

12. The method according to claim 10 further comprising the step of reiterating all steps once per video signal frame.

13. The method according to claim 10 further comprising the step of reiterating all steps at intervals greater than once per video signal frame.

14. The method for automatic gain control in a video signal processing system according to claim 10 wherein the step of determining an unfiltered fine gain control value G_F further comprises steps of:

using a first-order filter coefficient value β of unity, determining an unfiltered fine gain control value G_F according to the relationship,

$$G_F = G_F[n-1] + \beta * (a/b + G_F[n-1]) * [N_{NOM} / (N_{BP} - N_{ST}) - 1] \quad \text{(Equation 4)}$$

wherein N_{BP} is the mean back-porch level and N_{ST} is the mean sync-tip level for the current video frame;

wherein N_{NOM} is the desired sync height;

wherein a is the y-intercept and b is the slope of the linear fine gain control equation;

for the condition $G_F < G_{MIN}$, selecting a new coarse gain control value $G_C[n]$, such that a new fine gain control value $G_F[n]$ is maintained between G_{MIN} and G_{MAX};

for the condition $G_F > G_{MAX}$ selecting a new coarse gain control value N_{CG}, such that a new fine gain control value $G_F[n]$ is maintained between G_{MIN} and G_{MAX};

wherein G_{MIN} is a pre-selected minimum fine gain control value, and G_{MAX} is a pre-selected maximum fine gain control value.

15. The method for automatic gain control in a video signal processing system according to claim 10 wherein the step of determining a second coarse gain control value $G_C[n]$ further comprises steps of:

using an unfiltered fine gain control value G_F, and using a first coarse gain control value $G_C[n-1]$, determining a second coarse gain control value $G_C[n]$ according to the relationship,

$$G_C[n] = (a'/b' + G_C[n-1])^* (a/b + G_F) * 0.5$$
$$*[(a/b + G_{MIN})^{-1} + (a/b + G_{MAX} + 1)^{-1}] - a'/b' + 0.5 \text{ (Equation 5);}$$

wherein G_{MIN} is a pre-selected minimum fine gain control value, and G_{MAX} is a pre-selected maximum fine gain control value; and

wherein a' is the y-intercept and b' is the slope of the linear coarse gain control equation, and a is the y-intercept and b is the slope of the linear fine gain control equation.

16. The method according to claim 15 further comprising the steps of representing the first fine gain control value $G_F[n-1]$ and the second fine gain control value $G_F[n]$ as a 12-bit digital value and representing the first coarse gain control value $G_C[n-1]$ and the second coarse gain control value $G_C[n]$ as 4-bit digital values.

17. The method for automatic gain control in a video signal processing system according to claim 10 further comprising the step of:

using a first coarse gain control value $G_C[n-1]$, and using a second coarse gain control value $G_C[n]$, modeling a fine gain control value $G_F[n]$ using the relationship,

$G_F[n] = -a/b + (a/b + G_F) * [(a'/b' + G_C[n-1]) / (a'/b' + G_C[n])]$ (Equation 7);

wherein a' is the y-intercept and b' is the slope of the linear coarse gain control equation, and a is the y-intercept and b is the slope of the linear fine gain control equation.

18. An automatic gain control system comprising:

input monitoring means for monitoring a video input signal amplitude for comparison with a pre-selected nominal value; and

a gain adjusting means for adjusting a gain value responsive to the monitoring means at the frame rate of the video input signal.

19. An automatic gain control system according to claim 18 wherein the gain value may be expressed in terms of the product of a coarse analog gain and a fine digital gain and wherein the adjusting means further comprises means for responsively adjusting coarse analog gain and fine digital gain control components of the gain value.